REMARKS

Claims 1-30 and 32 will be pending upon entry of the present amendment. Claims 1, 3, and 15 are being amended. No new matter is being presented.

One embodiment of the invention is directed to a method for determining a score characteristic of a definition of a digital image. The method includes cumulating quadratic norms of horizontal and vertical gradients of luminance values of pixels of the image to determine a cumulated total. In addition, the method chose the pixels for the cumulating step at least according to a comparison of a maximum luminance threshold to adjacent pixels in a concerned direction. In other words, when determining whether a particular pixel will be selected to have its gradient added to the cumulated total, the luminance values of pixels that are adjacent to the particular pixel are first compared to the maximum luminance threshold. If the luminance values of the adjacent pixels exceed the maximum luminance threshold, then the particular pixel will not have its gradient added to the total.

This feature of the method is highly advantageous for several reasons. The method is not limited to choosing pixels only at the boundary between an iris and a pupil of an eye. In the case that the method is applied to an image of an eye, the method may take into account the pixels of the iris as a whole. In this case the method can more effectively eliminate possible inaccuracies introduced into the definition score based on specular spots. A specular spot appearing in the image will have no effect on the definition score, because not only will the gradient of the pixels in the specular spot not be taken into account, but the gradient of any pixel too close to the specular spot will also not be added to the score. In addition to this, any other bright aberration in the image can effectively be prevented from causing a faulty definition score for the image.

Obviousness Rejections

Choi and Zhang '440

Claims 1-7, 11, 15, and 31-33 were rejected under 35 U.S.C. § 103 as being unpatentable over Choi (IEEE pub titled "New Auto-focusing Technique using the Frequency

Selective Weighted Median Filter for Video Cameras") in view U.S. Patent No. 5,953,440 to Zhang et al. ("Zhang '440).[1]

Choi and Zhang '440 do not teach or suggest the invention recited in claim 1, as amended to include the features of previous claim 31. Amended claim 1 recites choosing the pixels for the cumulating step at least according to a comparison of a first maximum luminance threshold to adjacent pixels in a concerned direction, wherein the choosing step includes, for each pixel of a group of pixels of the image:

comparing luminance values of pixels adjacent to the pixel to the first maximum luminance threshold; and

choosing the pixel for the cumulating step at least according to the comparing of the luminance values of adjacent pixels to the first maximum luminance threshold.

Choi and Zhang '440 do not teach or suggest, for each pixel, choosing the pixel for the cumulating step at least according to the comparing of the luminance values of adjacent pixels to the first maximum luminance threshold. Instead, Zhang '440 teaches that the gradient of a pixel will be calculated if the gray scale value of **that pixel** falls within a certain range, i.e., between a median pupil value M_p and a median iris value M_i (col. 3, lines 18-22). Comparing a single gray scale value of the pixel being selected to the values M_p, M_i does not amount to a comparison of plural adjacent pixels to a maximum luminance value as recited in claim 1. At no point does Zhang '440 or Choi suggest choosing the pixels for the cumulating step at least according to a comparison of a first maximum luminance threshold to adjacent pixels in a concerned direction.

The applicants respectfully disagree with the Examiner's assertion that Zhang '440 "discloses choosing the pixels for gradient measuring step according to a comparison of a first maximum luminance threshold to adjacent pixels in a concerned direction." Zhang '440 never suggests choosing a pixel according to a comparison of other pixels to a luminance threshold. The Examiner relies on the language of step 20 of Zhang '440, but that language does

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[1]   It appears that the inclusion of claims 3-5 in the rejection based only on Choi and Zhang '440 is an inadvertent mistake. The Examiner admitted on page 4 that Choi and Zhang '440 do not teach or suggest the features of claim 3, and cited U.S. Patent No. 5,398,292 to Aoyama. Accordingly, claims 3-5 will be treated as rejected based on Choi, Zhang '440, and Aoyama.

not support the Examiner. Step 20 refers to all pixels having <u>a gray scale value</u> greater than Mp and less than Mi. Step 20 does not refer to all pixels having adjacent pixels with gray scale values greater than Mp and less than Mi. As such, step 20 Zhang '440 computes the gradient for a pixel if that pixel has <u>a gray scale value</u> between Mp and Mi.

Thus claim 1 is patentable over Zhang '440 and Choi.

Claims 2, 6-7, and 11 depend on claim 1, and thus, are nonobvious for the reasons expressed above.

Although the language of claims 15-20 is not identical to that of claim 1, the nonobviousness of claims 15-20 will be apparent in view of the above discussion.

Choi, Zhang '440, and Aoyama

Claims 3-5 and 32 appear to have been rejected under 35 U.S.C. § 103 as being unpatentable over Choi and Zhang '440 in view of U.S. Patent No. 5,398,292 to Aoyama.

Claim 3 is not obvious in view of Choi, Zhang '440, and Aoyama. Claim 3 recites that "the choosing step includes selecting a current pixel having a vertical or horizontal gradient to be taken into account in the cumulated total only if the luminances of two pixels distant from the current pixel by a predetermined interval in the concerned direction are smaller than said first maximum luminance threshold." The Examiner admits that Choi and Zhang '400 does not teach such a selecting step, but asserts that Aoyama provides the missing teaching.

Aoyama does not teach or suggest any selecting step. Instead, Aoyama uses a 5x21 pixel mask to obtain a sum-of-products value for a 5x21 matrix of pixel values in order to sense the slope of an edge centered at the center of the 5x21 matrix (See Fig. 3 and col. 4, lines 25-45). As such, Aoyama is not selecting whether to include the central pixel in a computation based on pixels surrounding the central pixel. Instead, Aoyama is simply using all of the pixels in the 5x21 matrix with no selection of any pixels being implied, and especially no selection of pixels based on luminance values of other pixels compared to a threshold. Thus, Aoyama does not supply the features missing from Choi and Zhang.

Accordingly, claim 3 is nonobvious in view of Choi, Zhang '440, and Aoyama. Claims 4-5 depend on claim 3, and thus, are also nonobvious.

Although the language of claim 32 is not identical to that of claims 1 and 3, the allowability of claim 32 will be allowable in view of the above discussions of claims 1 and 3.

Choi, Zhang '440, and Schwartz

Claims 8-10 were rejected under 35 U.S.C. § 103 as being unpatentable over Choi in view of Zhang '440 as applied to claim 1 in further view of U.S. Patent Application Publication No. 2002/0181746 to Schwartz et al. ("Schwartz").

The cited prior art does not teach or suggest the invention of claims 8-10, which depend from claim 1. In particular, Schwartz does not teach or suggest the features of claim 1 that are missing from Choi and Zhang '440. Instead, like Zhang '440, Schwartz only compares a selected pixel to a threshold rather than comparing pixels adjacent to the selected pixel to a threshold to choose the selected pixel for further processing. For at least this reason, claims 8-10 are all allowable.

Choi, Zhang '440, and Zhang '494

Claims 12-14 were rejected under 35 U.S.C. § 103 as being unpatenable over Choi and Zhang '440 in view of U.S. Patent No. 5,978,494 to Zhang ("Zhang '494").

The cited prior art does not teach or suggest the invention of claims 12-14, which depend from claim 1. In particular, Zhang '494 does not teach or suggest the features of claim 1 that are missing from Choi and Zhang '440. Instead, Zhang '494 simply specifies using the method of Zhang '440 (see col. 2, lines 30-55). For at least this reason, claims 12-14 are all allowable.

Cheng

Claims 16-20 were rejected under 35 U.S.C. § 103 as being unpatenable over Choi and Zhang '440 in view of U.S. Patent Application Publication No. 2004/0179752 to Cheng et al. ("Cheng"). Claims 21-22 were rejected under 35 U.S.C. § 103 as being unpatenable over Choi, Zhang '440, Cheng, and Zhang '494. Claims 23-24 were rejected under 35 U.S.C. §

103 as being unpatenable over Choi, Zhang '440, Cheng, and U.S. Patent No. 6,307,954 to Suzaki.

Claims 16-24 are nonobvious in view of the cited art because Cheng is not prior art. Cheng is based on an application filed on March 14, 2003, which is after the November 20, 2002 filing date of French Patent Application No. 02/14547 from which the present application claims priority. The certified copy of the priority application was filed on November 20, 2003, receipt of which was acknowledged in the April 18, 2007 Office Action. Enclosed is a verified English translation of the priority French Patent Application No. 02/14547. Accordingly, the claim of priority back to November 20, 2002 has been perfected, and thus, claims 16-24 are nonobvious.

Choi, Zhang '440, and Suzaki

Claims 25-28 were rejected under 35 U.S.C. § 103 as being unpatenable over Choi, Zhang '440, and Suzaki.

Claims 25-28 are nonobvious in view of the cited prior art. Claim 25 recites:

> for each pixel of a group of pixels of the image:
>
> comparing luminance values of pixels adjacent to the pixel to a maximum luminance threshold;
>
> choosing the pixel for the cumulating step at least according to the comparing of the luminance values of the pixels adjacent to the pixel to the maximum luminance threshold.

Claim 25 is nonobvious in view of the cited prior art. As discussed above with respect to claim 1, Choi and Zhang '440 do not teach or suggest choosing a pixel for a cumulating step according to the comparing of luminance values of adjacent pixels to a threshold. Likewise, Suzaki does not teach or suggest such a choosing step. Instead, Suzaki compares distances between a selected pixel and other pixels without suggest any choosing of a pixel for further processing based on the luminance values of adjacent pixels. For at least this reason, claims 25-28 are nonobvious.

Choi, Zhang '440, Suzaki, and Zhang '494

Claims 29-30 were rejected under 35 U.S.C. § 103 as being unpatenable over Choi, Zhang '440, Suzaki, and Zhang '494.

The cited prior art does not teach or suggest the invention of claims 29-30, which depend from claim 25. In particular, Zhang '494 does not teach or suggest the features of claim 25 that are missing from Choi, Zhang '440, and Suzaki. Instead, Zhang '494 simply specifies using the method of Zhang '440 (see col. 2, lines 30-55). For at least this reason, claims 29-30 are allowable.

Conclusion

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,

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